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Original title on 712 A/B: JITDA-ARENA an intra-theater distribution simulation

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JITDA ARENA

Intra-theater Simulation

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- Problem Statement
- Scope
- Model Overview
- Inputs
- Processing Logic
- Outputs





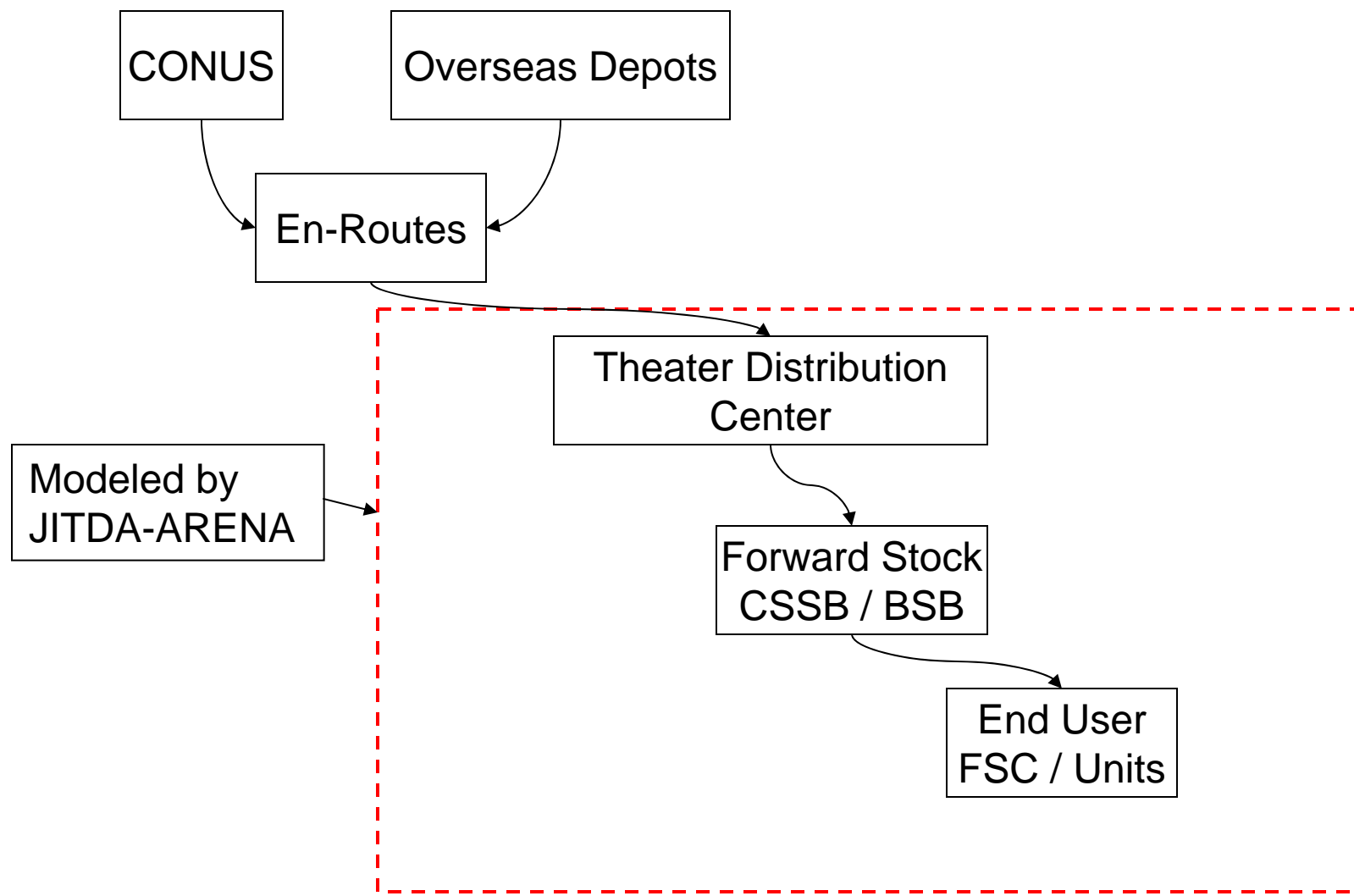
Problem Statement

- Joint Intra-Theater Distribution Assessment (JITDA): Conduct theater distribution assessments to determine required joint distribution capabilities to point of effect (e.g. across “last tactical mile”) with attention paid to the distribution of non-routine sustainment.
- Modeling: Need a simulation to model the flow of sustainment through the distribution network.
 - Challenges:
 - Non-routine sustainment is unpredictable, which lends itself to stochastic generation
 - Dynamic mode and route selection

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Model Scope



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Model Overview

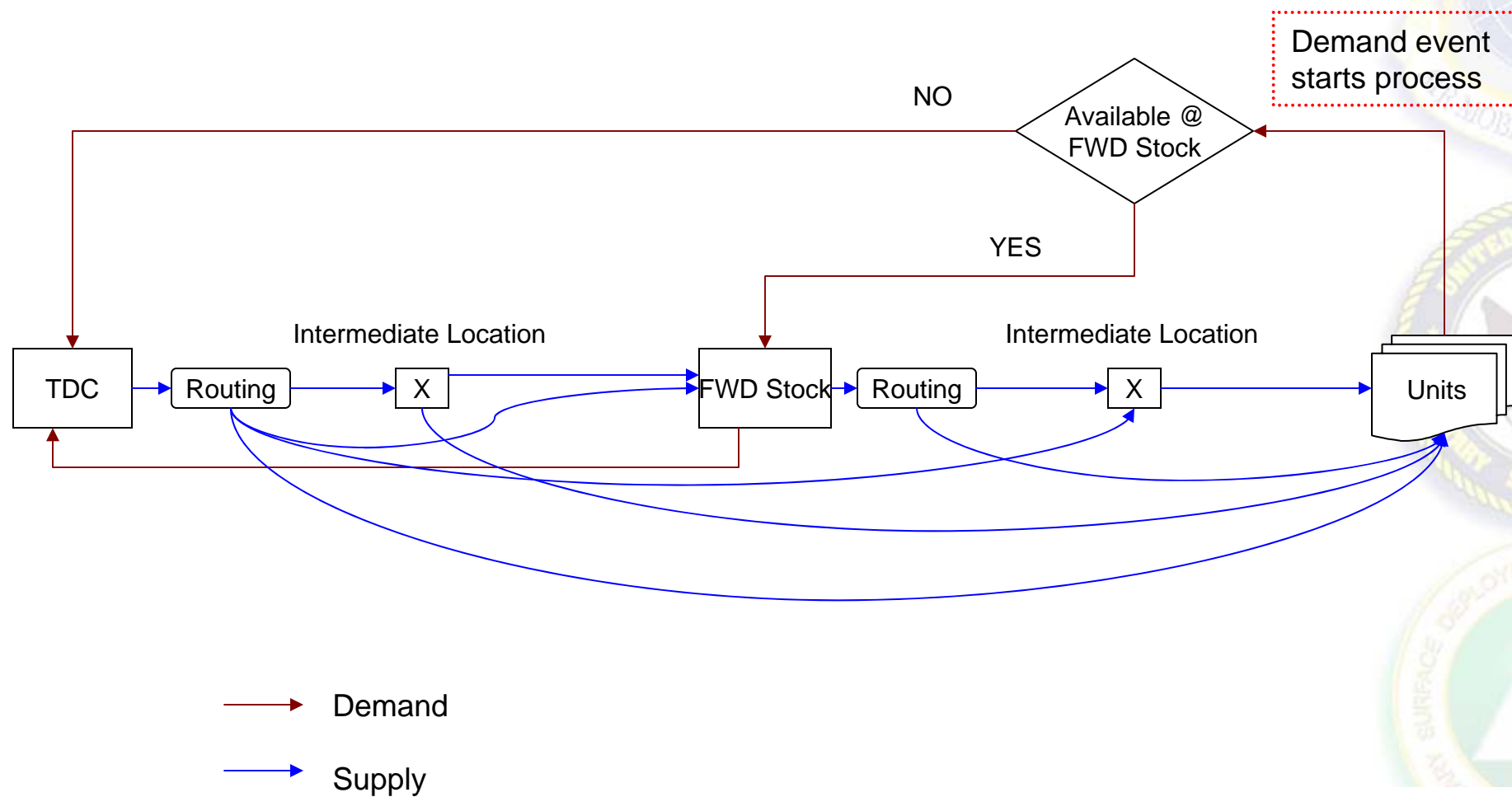
- Built using ARENA simulation package
 - ARENA is a general purpose, commercial off the shelf (COTS), discrete event simulation package
- Demand driven
 - A “pull” model
 - Demand pulse starts the resupply process
- Pallet based



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Model Overview



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Model Inputs

- Network Definition
 - Distances
 - Link and Node information
 - Attributes
 - Capacities
- Platform information
- Demand information
 - Size and frequency
- Supply hierarchy
- Mode selection priorities





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- Network Definition
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Processing Logic



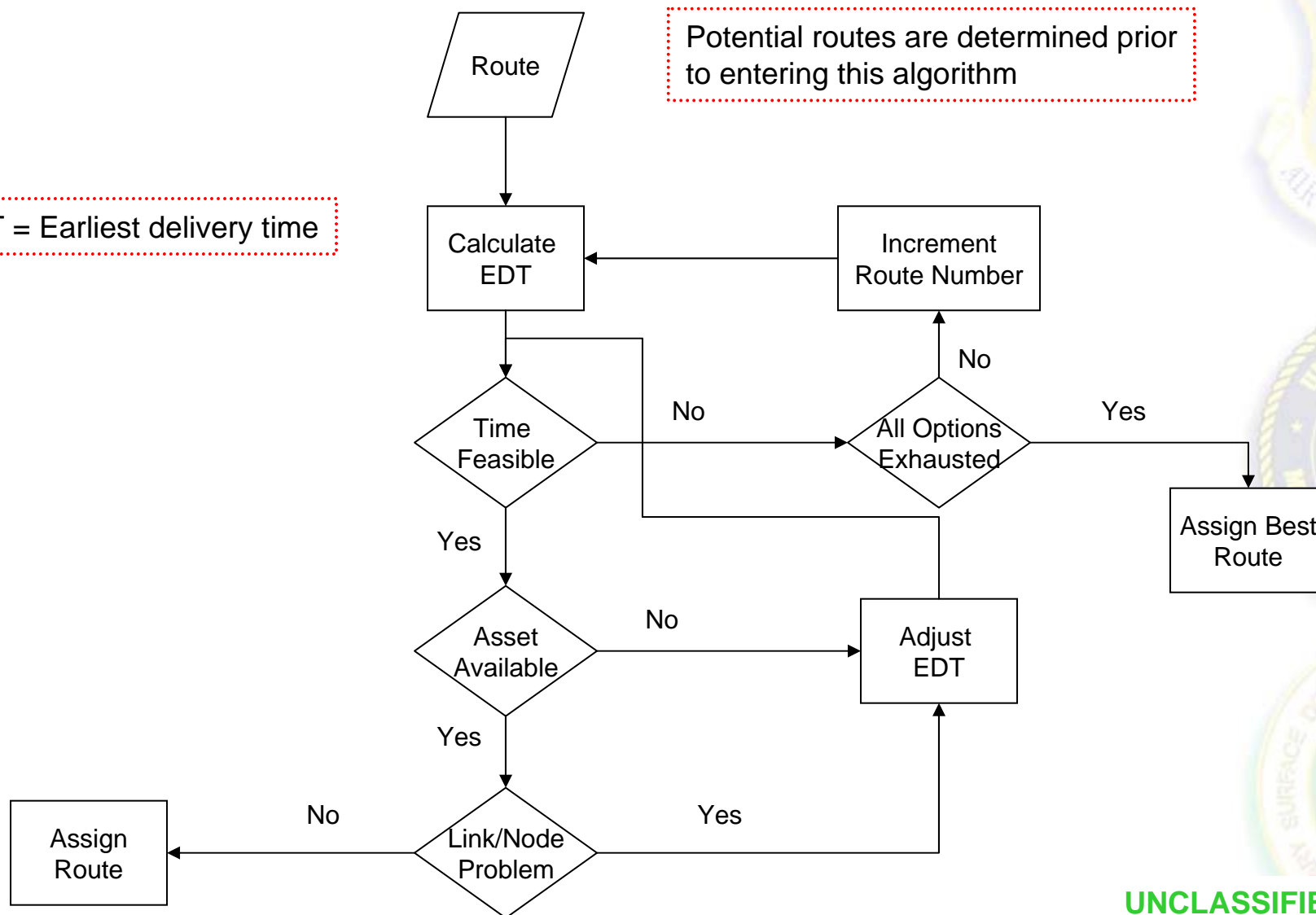
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Route Selection Algorithm

EDT = Earliest delivery time



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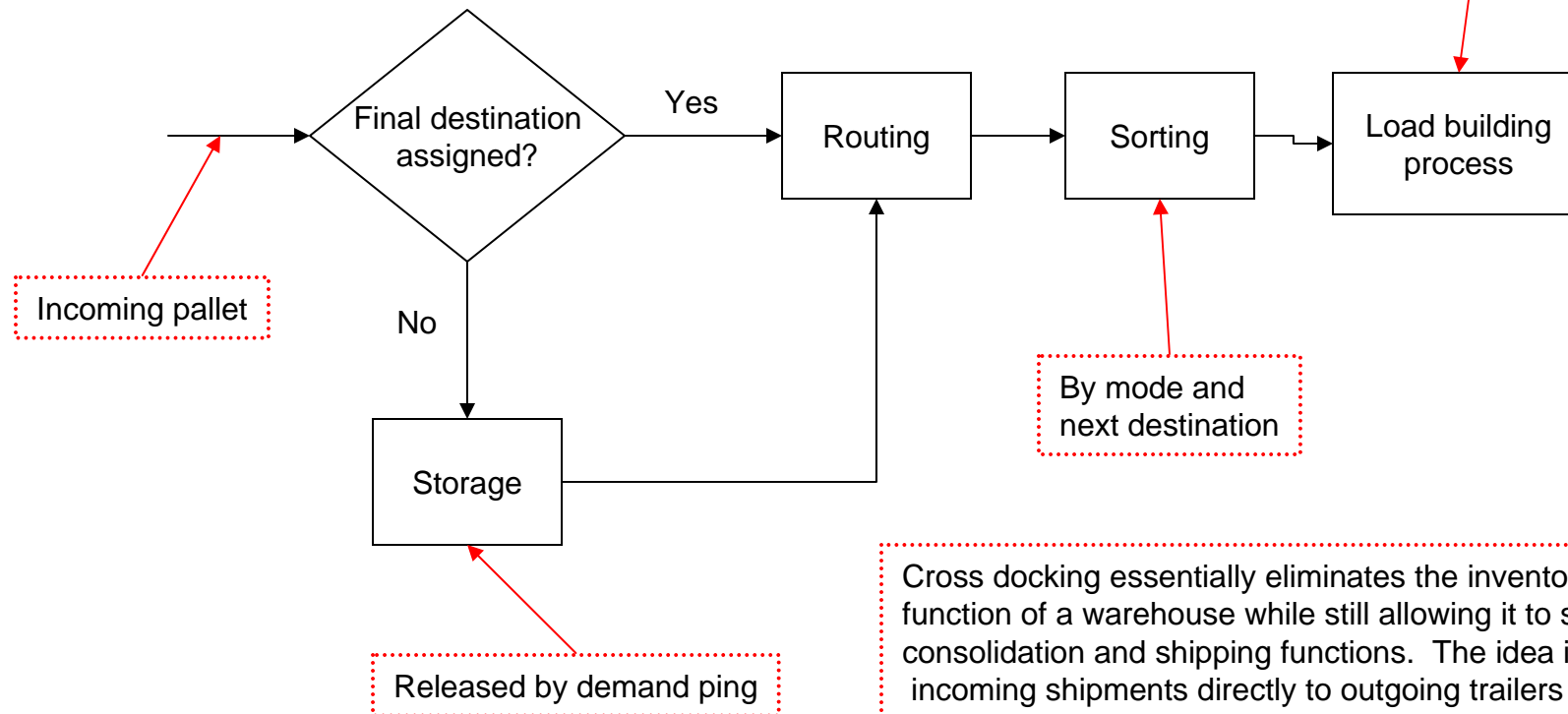
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Node Logic

Assumes node is not the pallets final destination

Process happens at all non originating and non terminating nodes



Cross docking essentially eliminates the inventory-holding function of a warehouse while still allowing it to serve its consolidation and shipping functions. The idea is to transfer incoming shipments directly to outgoing trailers without storing them in between. Goods arriving from the vendor already have a customer assigned, so workers need only to move the shipment from the inbound trailer to an outbound trailer bound for the appropriate destination.

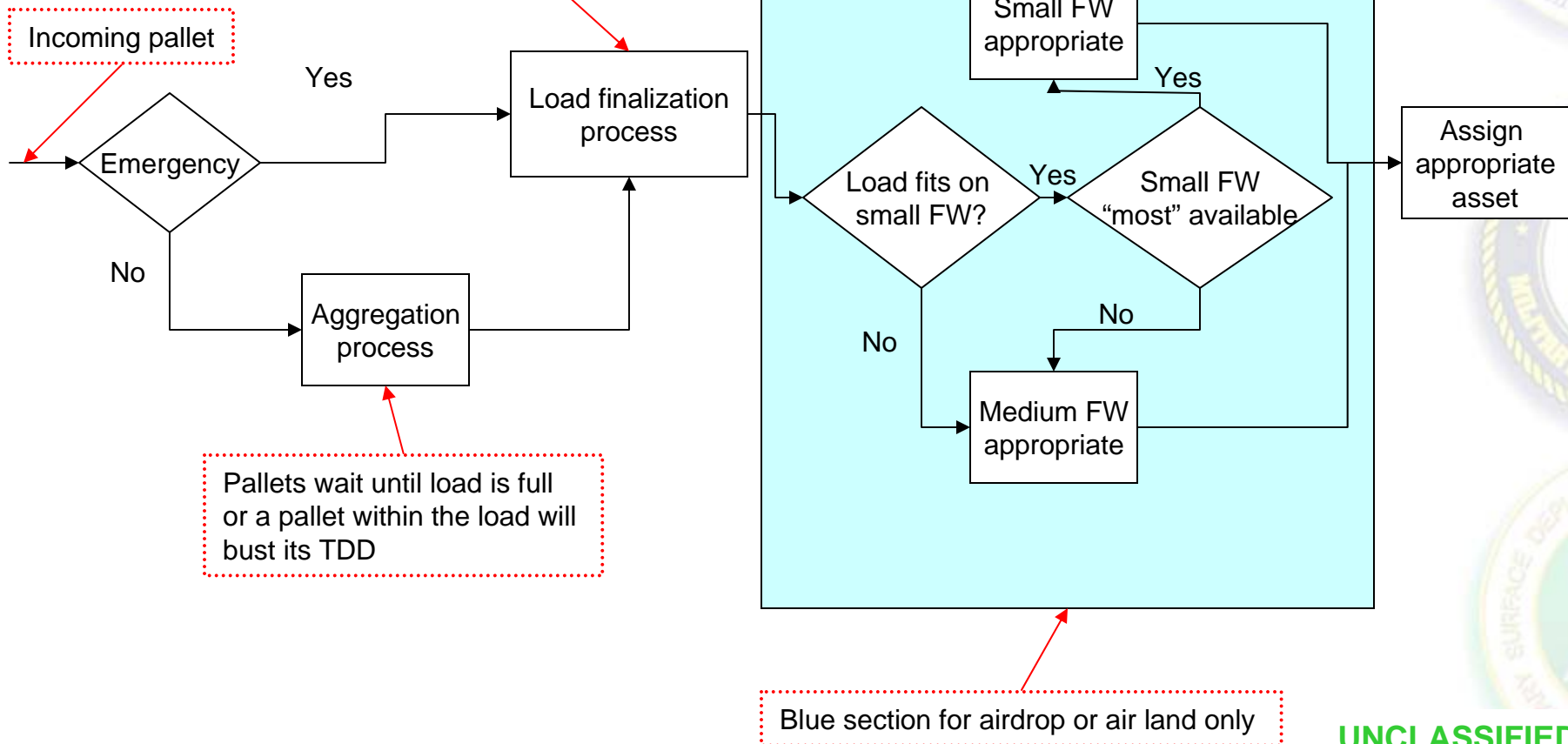
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Node Logic Cont.

For emergency, load finalization includes batching the emergency pallet with other pallets that happen to be already there waiting.



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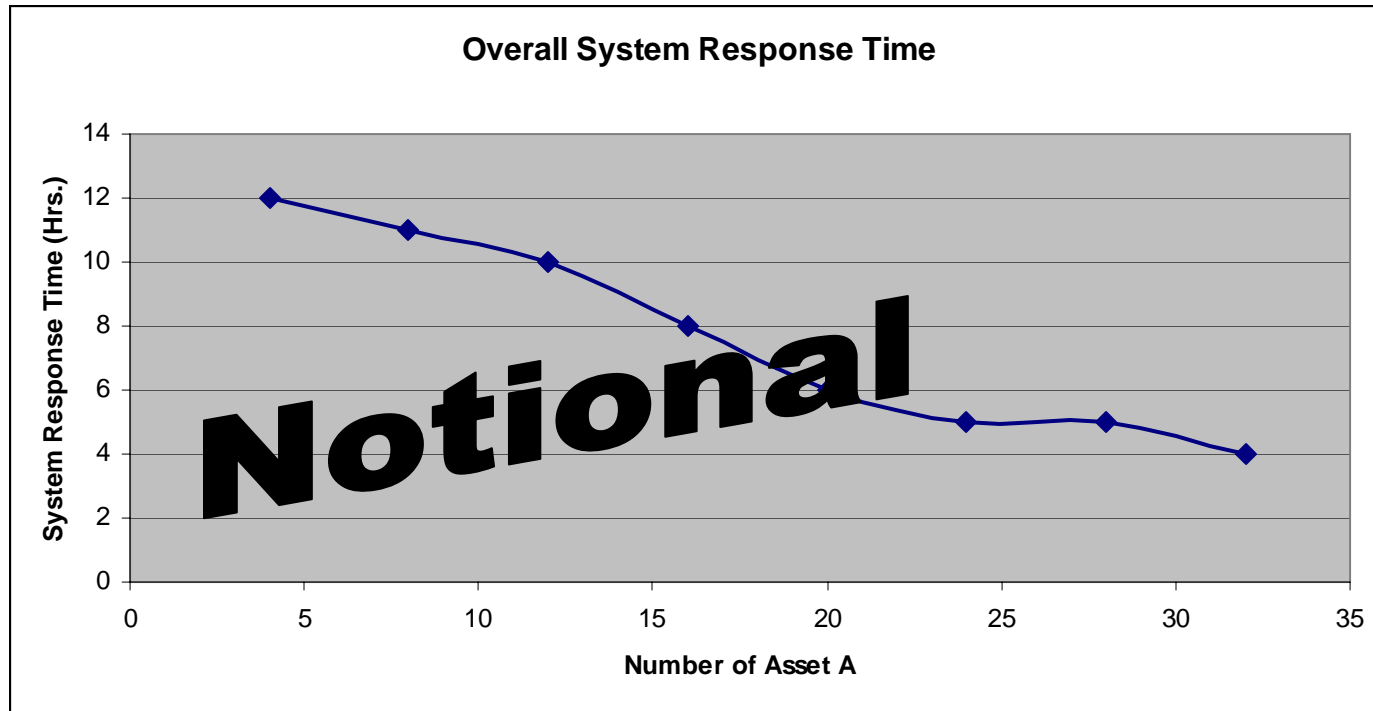


Model Outputs

- System Response Time
 - Time from demand pulse to delivery
 - Available for origin-destination pairs, by priority, by destination, by legs of a transload, etc.
- Asset Utilization
 - Number of assets being used at any one time
 - Amount of space used within each asset
- Delivery by Asset Type

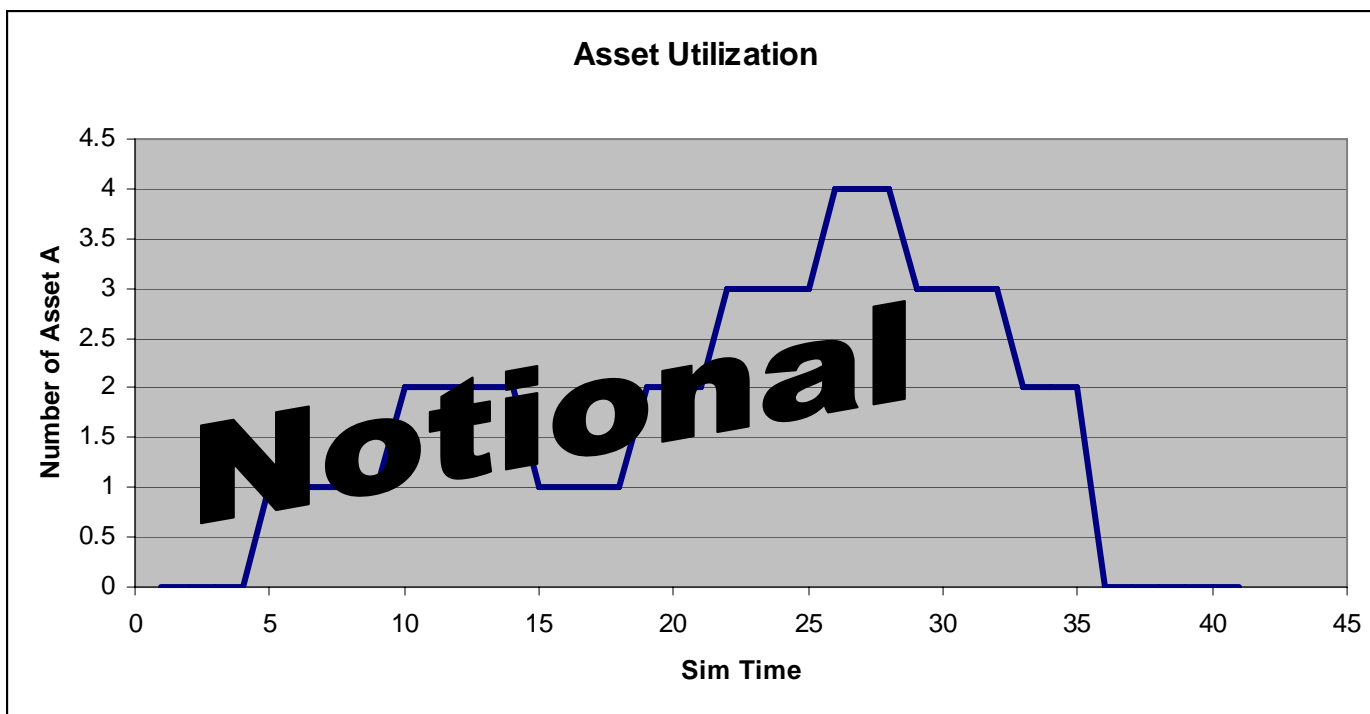


System Response Time



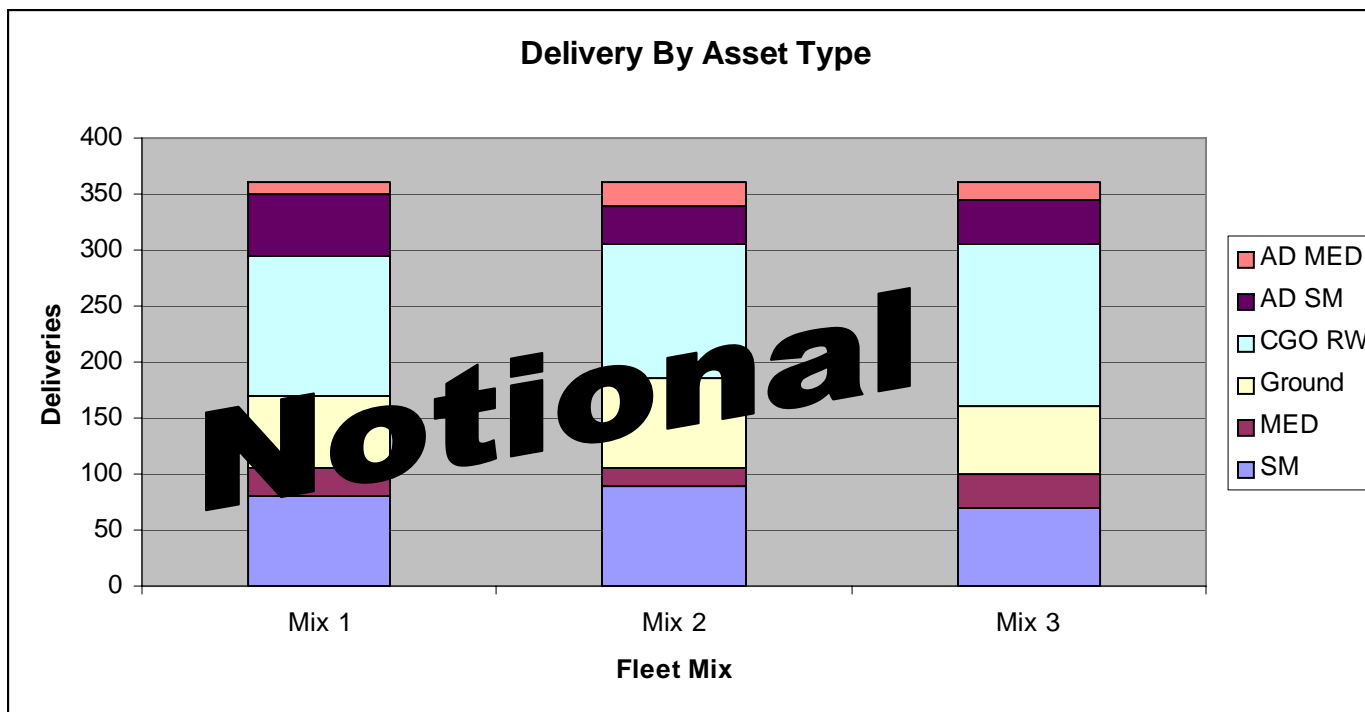


Asset Utilization





Delivery by Asset Type



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Questions



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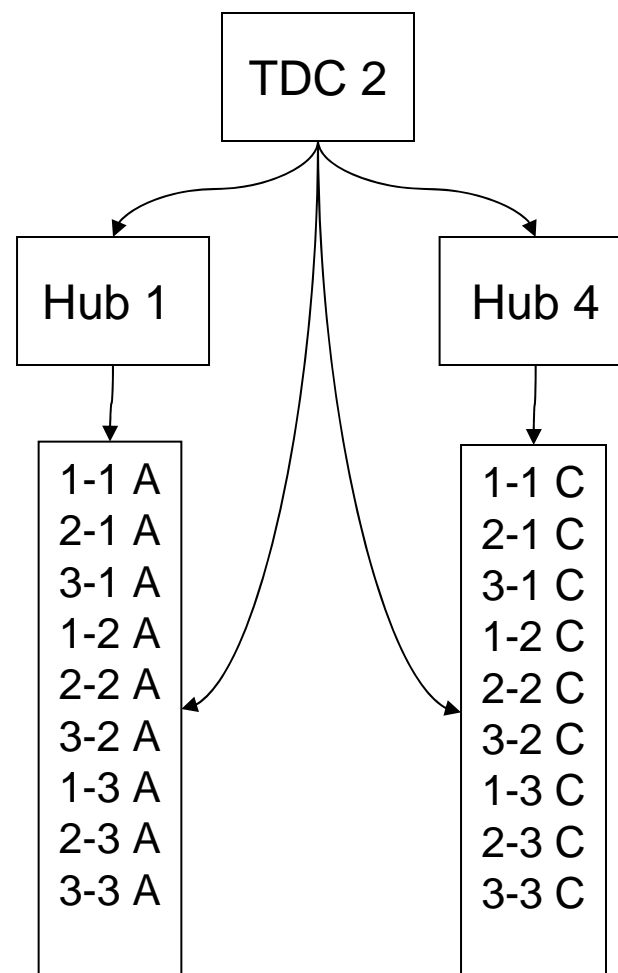
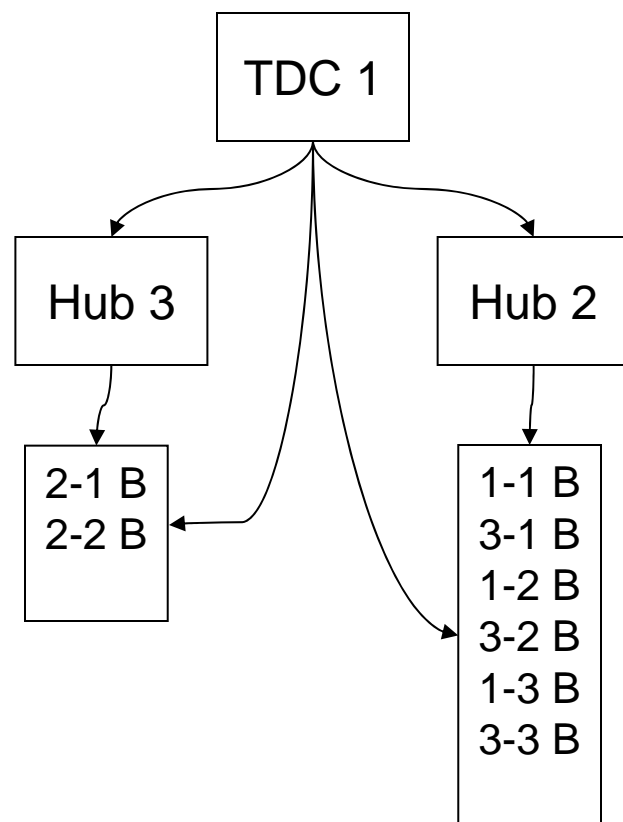
Backup



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Test Case Network



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Sample Output

Origin v. Destination

Destination									
Origin	1-1 A	2-1 A	3-1 A	1-2 A	2-2 A	3-2 A	1-3 A	2-3 A	3-3 A
TDC 1									
TDC 2	19.0614	28.98427	27.30174	29.29794	28.87833	31.14705	29.01112	32.13653	27.05975
Hub 1	10.58588	21.82401	27.55581	12.98271	25.14375	25.51441	11.45081	27.07382	26.05686
Hub 2									
Hub 3									
Hub 4									

Time in hours

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Sample Output

Origin v. Destination

Origin	Destination							
	3-0 B	1-1 B	2-1 B	3-1 B	1-2 B	2-2 B	3-2 B	3-3 B
TDC 1	47.70497	54.12916	53.49708	29.25749	53.32537	53.25975	49.75637	43.62758
TDC 2								
Hub 1								
Hub 2	25.0981	24.7642		5.798366	13.05094		25.35096	7.005463
Hub 3			25.73339			22.89329		
Hub 4								

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Sample Output

Origin v. Destination

Origin	Destination								
	1-1 C	2-1 C	3-1 C	1-2 C	2-2 C	3-2 C	1-3 C	2-3 C	3-3 C
TDC 1									
TDC 2	32.16339	23.57609	35.64736	25.1494	26.59478	34.322	23.6708	25.94156	30.30376
Hub 1									
Hub 2									
Hub 3									
Hub 4	4.306472	6.715309	9.175361	4.55961	7.392124	10.41109	6.333035	11.30328	14.12176

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Sample Output

Totals Location	Emergency Total	<6	6<x<12	>12	Intermediate Total	<24	24<x<48	>48
1-1 A	60	60	0	0	119	80	38	1
2-1 A	51	43	6	2	115	25	62	28
3-1 A	56	48	3	5	116	26	58	32
1-2 A	64	59	5	0	113	23	45	45
2-2 A	54	48	6	0	109	7	66	36
3-2 A	60	53	5	2	111	5	57	49
1-3 A	59	54	2	3	109	29	45	35
2-3 A	57	52	4	1	119	2	68	49
3-3 A	63	62	1	0	116	5	75	36
3-0 B	55	55	0	0	110	35	75	0
1-1 B	54	50	4	0	119	69	50	0
2-1 B	61	58	3	0	110	50	60	0
3-1 B	55	55	0	0	119	0	119	0
1-2 B	55	44	11	0	112	76	36	0
2-2 B	56	30	26	0	108	57	51	0
3-2 B	56	19	37	0	107	43	64	0
3-3 B	52	52	0	0	105	0	95	10
1-1 C	55	55	0	0	117	115	2	0
2-1 C	57	53	4	0	122	109	13	0
3-1 C	51	51	0	0	117	97	20	0
1-2 C	54	52	2	0	110	109	1	0
2-2 C	58	55	3	0	109	85	24	0
3-2 C	53	53	0	0	116	87	29	0
1-3 C	51	47	4	0	110	89	21	0
2-3 C	54	51	3	0	117	83	34	0
3-3 C	55	55	0	0	112	82	30	0

Numbers Represent Number of Pallets

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